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“Step Out From the Old to the New”

IS 14200 (1994): Hydrogen Peroxide--Code of Safety. UDC
661.491 : 614.878



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IS 14200 : 1994

भारतीय मानक

हाईड्रोजन परऑक्साईड, — सुरक्षा संहिता

Indian Standard

**HYDROGEN PEROXIDE — CODE OF
SAFETY**

UDC 661.491 : 614.878



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NEW DELHI 110002

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

Hydrogen peroxide is used as an oxidising agent in many organic reactions, manufacture of epoxidised oils, organic peroxide, inorganic peroxide, bleaching of textiles, silk, mechanical and chemical pulp, deinking of waste papers, extraction and purification of metals, pickling of copper and copper alloys, etching and cleaning of printed circuits, odour control, detoxification of industrial waste waters, decomposition of heat treatment salts, oxidation of dyes, sterilization and disinfection and related fields.

In the preparation of this code considerable assistance has been derived from the following publications:

- a) Dangerous Properties of Industrial Materials. 6th edition by N. Irvin Sax.
- b) Hydrogen Peroxide Manual No. P1. 1. 1 and P1. 3.1 published by Interfox Society Anonyme, Belgium.
- c) Hazardous Chemicals Data Book, 2nd edition by G. Weiss published by Noyel Data Corporation, New Jersey, USA-1986.

The composition of the technical committee responsible for the formulation of this standard is given in Annex A.

**AMENDMENT NO. 1 AUGUST 2007
TO
IS 14200 : 2000 HYDROGEN PEROXIDE —
CODE OF SAFETY**

(Page 2, clause 5.1.1) — Substitute the following for the existing:

Threshold limit value : ACGIH Threshold Limit Value (TLV-TWA) — 1 ppm

NOTES

1 ACGIH (TLV-TWA) the TWA concentration for a conventional 8 h work day and 40 h work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day for lifetime without adverse effect

2 ACGIH (TLV-CL) Ceiling Value, the concentration that should not be exceeded during any part of the working exposure, if instantaneous measurements are not available, sampling should be conducted for the minimum period of the time sufficient to detect exposures at or above the ceiling value.

3 ACGIH (TLV-STEL) indicates Short Term Exposure Limit. A 15 minutes TWA exposure that should not be exceeded at any time during a work day, even if the 8 h TWA is within the TLV-TWA. Exposures above the the TLV-TWA up to the TLV-STEL should be less than four times per day, and there should be at least 60 minutes between successive exposures in this range.

(CHD 8)

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Indian Standard

HYDROGEN PEROXIDE — CODE OF SAFETY

1 SCOPE

This standard prescribes mainly properties of aqueous solution hydrogen peroxide, the nature of hazards associated with it and essential information storage, handling, packing, labelling, disposal of wastes, training of personnel, personal protective equipment and first aid.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	Title
4155 : 1966	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals
4167 : 1980	Glossary of terms relating to air pollution (first revision)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 4155 : 1966 and IS 4167 : 1980 shall apply.

4 PROPERTIES

4.1 General Information

Hydrogen peroxide is a clear, colourless syrupy liquid miscible with water in all proportions. It is also soluble in alcohol and ether. It is a powerful oxidising agent. Its solutions of 30 percent and above can very easily cause blistering of skin. Dangerous by chemical reaction with flammable materials. It may explode at higher concentration if not handled properly, or contaminated with some organics or metal catalysts, exposed to heat, mechanical impact or detonation of blasting cap.

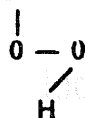
4.1.1 Common Name

Peroxide, hydrogen peroxide, T-stuff, oxygenated water, hydrogen dioxide.

4.1.2 Chemical Name — Hydrogen peroxide.

4.1.3 Chemical Formula — H_2O_2

4.1.4 Structural Formula — H



4.1.5 Molecular Weight — 34.016.

4.1.6 CAS No. — 7722-84-1.

4.2 Physical Properties

4.2.1 Description of Colour, Odour, Physical State

Hydrogen peroxide is a clear, colourless liquid, free from suspended impurities and dust, miscible in water in all proportion. It has a slightly sharp odour at ordinary concentration. Above 60 percent (m/m) concentration the odour will be pungent.

4.2.2 Boiling Point (at 1 atm):

107°C for 35 percent (m/m)
113.9°C for 50 percent (m/m)
125°C for 70 percent (m/m)
152°C for 90 percent (m/m)

4.2.3 Specific Gravity:

1.191 at 25°C
1.29 at 20°C for 70 percent (m/m)
1.46 at 0°C for 90 percent (m/m)

4.2.4 Total Vapour Pressure:

1 mm at 15.3°C for 90 percent (m/m)

4.2.5 Miscibility/Solubility with Common Solvents

It is miscible with water in all proportions.

4.3 Chemical Properties

4.3.1 Reactivity — Hydrogen peroxide is acidic in nature and is a powerful oxidising agent. Readily oxidisable materials or alkaline substances containing heavy metals may react violently. Soluble fuels such as acetone, ethanol, glycerol will detonate on admixture with peroxide of over 30 percent concentration. Under certain circumstances it acts as reducing agent, that is, with potassium permanganate.

4.3.2 Stability at High Temperature

Elevated temperatures encourage decomposition, whereby reaction rate increases. The rate of decomposition reaction in solution (homogeneous) will increase 2 to 3 times for every 10° C rise of temperature.

4.3.3 Light Sensitivity

Light can cause photochemical decomposition of hydrogen peroxide. The absorption of radiation by hydrogen peroxide solutions occurs over a wide spectrum.

4.3.4 Flammability

Hydrogen peroxide solutions themselves are not inflammable. However, hydrogen peroxide can cause spontaneous combustion of many organic materials such as, clothes, paper, wood, etc, with above 50 percent *m/m* strength combustion may be immediate. Even a dilute commercial solution can concentrate by evaporation and spontaneous combustion may sometimes occur after a period of storage.

4.4 Fire and Explosion Hazard Properties

4.4.1 Flash Point — Not flammable.

4.4.2 Hydrogen peroxide continually evolves some oxygen due to decomposition. Normally the decomposition rate is small but if provision is not made for the escape of this gas, the build up of high pressure will result in possible rupture of equipment.

4.4.3 Explosive Range

Commercial hydrogen peroxide solutions up to 70 percent by weight are not considered to be explosive of their own. However, explosions may occur under some circumstances when aqueous hydrogen peroxide solutions are mixed with organic compounds to form single phase emulsion or suspension or in presence of powerful reducing agent. Hydrogen peroxide vapour can explode under normal pressure if hydrogen peroxide concentration in vapour phase exceeds 26 percent (40 percent by weight).

4.4.3.1 Fire involving hydrogen peroxide may be of flaring type but not explosive unless confined.

4.5 Corrosion Properties — It is corrosive in nature.

5 TOXICITY INFORMATION AND HEALTH EFFECTS

5.1 General

5.1.1 TLV — 1 ppm (1.4 mg/m^3).

5.1.2 IDLH — 75 ppm (105 mg/m^3).

5.2 Route of Entry

Inhalation, ingestion and absorption through skin.

5.3 Exposure Concentration Duration and Health Effects

The inhalation of concentrated hydrogen peroxide mist or vapour can lead to irritation or itching of

the respiratory tract; a longer exposure may cause inflammation of respiratory organs or even lung edema.

5.3.1 Eyes

High concentration of hydrogen peroxide when it comes in contact with eyes can lead to severe corneal damages.

5.3.2 Ingestion

Hydrogen peroxide if swallowed can lead to bleeding of the mucous membranes and because of the oxygen which is suddenly released to distension of esophagus and the stomach, causing severe damages.

5.3.3 Skin Contact

Hydrogen peroxide cause a spontaneous white discoloration of upper layers of the skin (10 percent solution upwards), and the mucous membrane (5 percent solution upwards). Short contact of the skin with concentrated solution will cause a whitening accompanied by a tingling sensation. This discoloration of skin is nothing but tissue swelling due to diffusion of hydrogen peroxide and decomposition forming oxygen bubbles in the skin tissue.

6 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipments should include impermeable apron made of polyvinyl chloride or polyethylene film, neoprene, rubber gloves, boots and goggles or face shield should be used to prevent splashing of the liquid into the eyes.

7 STORAGE, HANDLING, LABELLING AND TRANSPORTATION

7.1 Storage

7.1.1 Small Containers

Small containers of pure aluminium of high density polyethylene should be stored unopened in the upright position and preferably not stacked too high, should be stored on concrete flooring, separated from heat and protected from the sun. The place must be well ventilated. It must be kept very clean and free from incombustible materials and other compatible chemicals such as alkalis, strong acid, etc. Water hose should be available for flushing away spillages and leaks, etc. Safety shower and an eye wash fountain should be provided. Pipe lines must not pass through storage area, especially those carrying chemicals. No special electrical regulations are necessary; but mercury vapour lamps are undesirable. Plastic bottles become brittle with prolonged contact with hydrogen peroxide.

7.1.2 Bulk Storage

Pure aluminium is recommended for storage tanks. Aluminium tanks can be erected both horizontally and upright for static reasons. Storage tanks should be placed on suitable safety trough. Before being filled first time the storage tanks and all parts of hydrogen peroxide storage should undergo suitable cleaning and passivation operations. Storage tanks must be filled with suitable venting device. Hydrogen peroxide in the piping should not remain trapped between two valves. An advice of an expert from manufacturer may be sought wherever necessary on storage and handling problems.

7.2 Handling

Wear protective gloves, boots close-fitting safety goggles, if necessary protective suits made of rubber or suitable plastics must be used. Care should be taken not to inhale hydrogen peroxide vapour or mist. Hydrogen peroxide is preferably siphoned out. Containers shall be moved by hand or lift trucks should not be rolled or left on the site. Hydrogen peroxide once removed should not be returned to the container due to possible contamination.

7.3 Labelling

The containers shall be labelled as per the provision of the relevant Acts and Rule.

7.4 Transport

7.4.1 During the transportation each container shall have identifying label with name 'Hydrogen Peroxide'. Road tanker shall have a placard class label. UN No. 2014 for 20 to 60 percent aqueous solution and 2015 for more than 60 percent solution. UN hazard class 5.1, EAC Hazchem code 2P up to 60 percent and 2PE above 60 percent.

7.4.2 During shipping in drums the materials may have to be stored in such a way that it should fulfil all instruction of storage given under 7.1.

7.4.3 The Rules and Regulations for transportation of hazardous chemicals shall be strictly adhered to.

8 SPILLAGE/LEAKAGES AND WASTE DISPOSAL

8.1 Spillage/Leakage

8.1.1 If spills and leaks occur, wash off all contaminated surface with plenty of water.

8.1.2 Do not absorb in any combustible material.

8.1.3 Do not attempt to recover spilled liquid.

8.1.4 Do not attempt to transfer hydrogen peroxide into other unidentified container.

8.1.5 If the container is leaking through its vent as a result of having been tipped on its side, then only

action required will be to restore it in a vertical position and to wash the outside surface of the containers and surrounding area with copious quantities of water.

8.1.6 If a plastic container appears to be bulging, more likely it is the result of excessively high decomposition taking place. The first action should be to take off screw cap and insert carefully to relieve the pressure. If there is any sign of undue decomposition such as bubbles on the surface of the liquid or outside of the container feels warm, then the contents should be diluted and disposed to the drain as soon as possible.

8.1.7 In case of fire wear a fire-suit equipped with independent breathing apparatus before entering contaminated zone. Use water only for extinguishing the fire. Do not use foam or dry chemical extinguishers. Keep adjacent containers cool by spraying with water.

8.1.8 Storage Tank Leaks

If the leak is large and serious and cannot be easily stopped by isolating the valves then copious amount of water should be directed into the bunk and kerbed area, before repair can begin. If leak is in main tank then this will need to be emptied either into small containers or into another suitable container compatible with hydrogen peroxide. If the leak is small and occurs in some section of pipe work that can be isolated, then the local repairs can be carried out.

8.2 Waste Disposal

All relevant regulations of local and state authorities for prevention and control of pollution should be observed. (Hydrogen peroxide decomposes of its own giving water and oxygen the product universally accepted and not creating an additional pollution).

8.2.1 Dispose off hydrogen peroxide by diluting it with plenty of water.

9 FIRE PROTECTION AND FIRE FIGHTING

9.1 Fire Fighting

Water spray in plenty is most effective for extinguishing fire induced by hydrogen peroxide. Do not use foam or dry chemical extinguishers. Keep adjacent area and containers cool by spraying with water whenever fired.

10 TRAINING AND HEALTH MONITORING

10.1 Training and Education

Persons handling or working in plant involving hydrogen peroxide shall have training such that they can be expected to carry out their jobs effectively and safely. They should be familiar with

method of handling and be appraised of use of protective equipment for safe handling. During the instructions stress should be given about the hazards due to eye contacts, skin contacts, inhalations and ingestion. All persons should be familiar with the location of alarm boxes, first aid boxes, fire extinguishers and personal protective equipment.

10.1.1 Safety in handling hydrogen peroxide depends to a great extent on employee's education, proper safety instructions, intelligent supervision and use of safe equipment.

10.2 Health Monitoring

10.2.1 Pre-Employment Medical Examination

No special medical examinations other than routine medical check are required.

11 FIRST AID

11.1 Inhalation

In case of accidental inhalation, remove the victim to fresh air. Rescuers should wear suitable air-masks. Medical advice must then be sought.

11.2 Skin Contact

First immediate action for skin contact with hydrogen peroxide is repeated rinsing of affected area with plenty of water only. If required medical advice may then be sought.

11.3 Eye Contact

In case of hydrogen peroxide (even a small quantity) splashes in the eye the affected eye must be rinsed with clean water initially with eyewash bottle and subsequently with an irrigation device. This must be done immediately and continuously for at least 15 minutes. Refer promptly to a physician preferably to an eye specialist.

11.4 Ingestion

In case of accidental ingestion it is recommended that copious amounts of water to be drunk. If available milk or white of egg can be given. Do not induce vomiting. Then medical advice must be sought.

ANNEX. A

(Foreword)

COMMITTEE COMPOSITION

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(Continued on page 6)

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